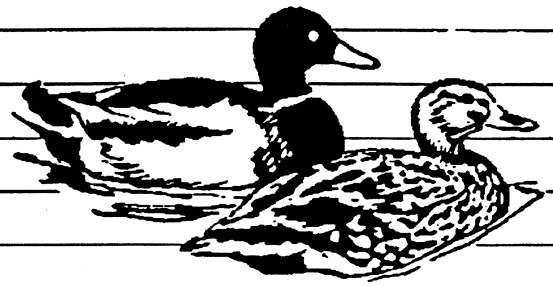
Research
Information bulletin
U.S. DEPARTMENT OF THE INTERIOR
NATIONAL BIOLOGICAL SURVEY



Number 85
1994

Reduced Winter Survival of Immature Canvasbacks at Catahoula Lake, Louisiana

Between 1955 and 1993, population indices for canvasbacks (*Aythya valisineria*) fluctuated between 364,000 and 760,000 birds and showed a general rate of decline of 0.6% per year. Habitat loss and degradation, low rates of recruitment, a highly skewed sex ratio favoring males, and reduced survival of canvasbacks during their first year are considered important constraints on population growth. Survival of immatures, especially females, is of special concern because return rates for female canvasbacks breeding in southwestern Manitoba suggest that on average only 21% of hens survive their first year (vs. 69% annual survival thereafter). Sources and timing of death for immatures have been studied during some segments of the annual cycle, but our understanding of factors contributing to reduced annual survival of immatures is incomplete.

Since 1985, Catahoula Lake, located in central Louisiana, has attracted more wintering canvasbacks than any other site in North America, including traditional wintering areas such as Chesapeake Bay and San Francisco Bay. About 27% of canvasbacks that we collected at Catahoula Lake in winter 1987–88 had lead shot in their gizzards. Because of the high prevalences of ingested lead, especially in immatures, and the large number of birds at risk, we undertook this study to estimate survival for immature canvasbacks wintering at Catahoula Lake.

Radio Transmitters Were Surgically Implanted in Lead-exposed and Unexposed Canvasbacks

We captured canvasbacks at night with spotlights. A blood sample was taken and analyzed for lead. Blood lead concentrations ≥ 0.2 ppm are considered above background levels, so birds with initial blood lead concentrations ≥ 0.2 ppm were considered to be "exposed" and all others "unexposed." Radio transmitters were surgically implanted into the abdominal cavities of canvasbacks. We attempted to radio-mark equal

numbers of exposed and unexposed birds. We implanted radio transmitters in both males and females because earlier studies showed no effect of sex on relative body condition or prevalences of ingested shot in Catahoula Lake canvasbacks.

Radio-tracking was accomplished by using aircraft and standard triangulation procedures. Status (alive or dead) of radio-marked canvasbacks was determined by pulse rate of transmitters. We attempted to locate birds daily during the hunting season and every 2–3 days during the nonhunt period. Dead birds were recovered immediately after they were discovered by using standard radio-tracking homing techniques.

We calculated survival estimates for canvasbacks with the Kaplan–Meier procedure. We compared survival curves using pairwise log-rank tests.

Winter Survival Was Reduced in Lead-exposed Canvasbacks

We radio-marked 30 immature canvasbacks in winter 1991–92 (17 exposed, 13 unexposed), 85 in winter 1992–93 (44 exposed, 41 unexposed), and 57 in winter 1993–94 (25 exposed, 32 unexposed). We recorded 5 deaths in winter 1991–92, 20 deaths in winter 1992–93, and 7 deaths in 1993–94. Causes of death (*n*, exposed:unexposed) were gunshot (10, 5:5), lead toxicosis (5, 4:1), drowning in commercial fishing net (2, 2:0), and unknown (15, 13:2).

There were no year-specific differences in survival of exposed and unexposed immatures ($P > 0.10$). Winter survival estimates for immatures with blood lead concentrations ≥ 0.2 ppm at the time of capture were lower ($P < 0.05$) than those of unexposed immatures in winter 1992–93 (0.569 vs. 0.815) and winter 1993–94 (0.578 vs. 0.923) but did not differ ($P > 0.25$) in winter 1991–92 (0.747 vs. 0.857; Figure).

Survival rates for Catahoula Lake canvasbacks, especially lead-exposed individuals, were lower than published estimates for immature females wintering in coastal Louisiana (0.952 ± 0.065) or Chesapeake Bay (range = 0.833–0.930). Only 5 of 32 deaths were attributed to lead toxicosis, but lead exposure obviously contributed directly or indirectly to additional deaths. For example, although causes of death for 15 birds were unknown, all but 2 of these unknowns were initially lead-exposed. Recovery of 11 of these transmitters from the lake's brushy perimeter—and, in one instance, from a tree cavity—was suggestive of mammalian or avian predation; however, salvaged remains were insufficient to allow us to distinguish scavenged carcasses (i.e., birds dying of other causes) from apparent predations.

Illegal Harvest Was an Important Source of Mortality for Catahoula Lake Canvasbacks

Illegal harvest was an important cause of death for immature canvasbacks at Catahoula Lake, as it was at Chesapeake Bay. Ten of 17 birds for which we were able to determine cause of death died of gunshot wounds. Hunting deaths were probably not intentional but rather resulted from hunters not being able to distinguish canvasbacks from legal species. This was the situation in a closed area on the upper Mississippi River near La Crosse, Wisconsin, where almost 41% of hunters encountering canvasbacks apparently misidentified the birds and shot at them. Encounter rates with hunters have not been quantified for canvasbacks at Catahoula Lake but are probably high when water levels are low because of the high density of hunters, limited refuge area available to birds, canvasback feeding preferences for arrowhead (*Sagittaria* spp.) and chufa flatsedge tubers, and dispersion of blinds in relation to available shallow-water feeding areas. Moreover, increases in canvasback numbers at Catahoula Lake are recent, so hunters may be unfamiliar with the species.

Most Lead-exposed Canvasbacks Survived Winter

Ingestion of one lead shot can be lethal to ducks. Nonetheless, we documented winter deaths for only 28 of 86 immature canvasbacks that had elevated blood levels at the time of capture. Susceptibility of canvasbacks to lead toxicosis may be influenced by the timing of exposure and relative body mass. Lead retention rates are unknown for free-ranging ducks, but blood lead or protoporphyrin concentrations remained elevated in captive ring-necked ducks (*A. collaris*) and canvasbacks for 4–7 weeks after experimental dosing. During exposure, canvasbacks reduce feeding and lose an average of 200 g of body mass and 105 g of fat. Body mass and fat levels of

canvasbacks wintering at Catahoula Lake change seasonally. Thus, if survival of lead exposure is related to the physical condition of individuals at the time of exposure (i.e., ability to sustain loss of body mass and fat), then risks to survival associated with lead ingestion probably are greatest in November when immatures are leanest.

Whereas birds may survive lead exposure in other months, reduced fat may affect timing and performance of subsequent annual cycle events. For example, if variation in fat levels regulates population ingress and egress at migratory stopover sites, then onset of spring migration may be delayed in lead-exposed birds compared with unexposed birds. Reproductive performance of canvasbacks may also be affected by exposure to lead in winter if migration chronology is delayed in lead-exposed individuals and if time of arrival on spring-staging and breeding areas (i.e., sites where birds initiate courtship and pair-bond formation) influences reproductive success. Additional research is needed to determine the extent to which the lead effects persist beyond winter and influence annual survival rates and reproductive performance.

Management Implications

In spite of the ban on use of lead shot by waterfowl hunters in the United States in 1991, ingestion of lead shot deposited in wetlands before implementation of the ban remains a problem at some sites. We suggest that lead exposures in waterfowl should be periodically monitored. We further recommend that managers give highest priority to making lead shot unavailable to waterfowl at important concentration areas that are known to be contaminated with lead (e.g., Catahoula Lake). Techniques available to accomplish this objective (such as plowing) may require further investigation but, given the present low levels of waterfowl populations in North America, it is imperative that management actions to reduce waterfowl exposure to lead be implemented soon.

For further information contact

William L. Hohman or Joseph L. Moore
Southern Science Center
700 Cajundome Boulevard
Lafayette, Louisiana 70506
(318)266-8662

or

J. Christian Franson
National Wildlife Health Center
6006 Schroeder Road
Madison, Wisconsin 53711
(608)271-4640